

# **Report for 2002ME3B: EVALUATING CHANGES IN WATER CHEMISTRY AS RISK FACTORS FOR ATLANTIC SALMON IN DOWNEAST MAINE**

There are no reported publications resulting from this project.

**Report Follows:**

USGS Interim Report 2003  
USGS Salmon and related research

The number of salmon returning to Maine rivers has declined annually for more than a decade. There are a number of chemical agents that have been suggested as potentially responsible, including endocrine disruptors such as PCBs, herbicides such as arsenic and velpar, and natural aluminum from acid leaching of soils. We propose to evaluate recent changes in surface water chemistry that may *decrease the mitigation* of anthropogenic chemical agents, or *increase* the toxicity of these substances.

Pilot data from downeast Maine support the hypothesis that a general decline in ionic strength is underway in surface waters of the northeastern US. In particular, a decline in base cations may be removing some of the mitigation capacity of surface waters. Alternatively, an apparent increase in dissolved organic carbon may be increasing the chelation of some toxic substances and decreasing toxicity. The potential balance between these factors, and the uncertainties in the trends in acid-base status, lead to this proposal to address these uncertainties for downeast Maine. These data are directly relevant to the current debate over the Endangered Species Act listing for salmon.

Funding for this work is requested only for the first year, as seed money to attract funding from the Atlantic salmon stakeholders. These stakeholders have expressed their intention to fund this work and two projects have begun on Downeast Maine salmon rivers with funds from the Atlantic Salmon Commission.

The first project consisted of seventy-one samples from 62 sites collected on May 7, 2003, by 7 staff of ASC, NOAA, College of the Atlantic, and the UMaine Mitchell Center from 11 salmon rivers and streams in central and eastern Maine. The objective of the sampling was 1) to collect samples within a few hours on the same day on all rivers and all stations, and 2) measure pH and acid neutralizing capacity (ANC, or 'alkalinity') under identical conditions in the same laboratory. This was the first attempt to standardize the collection day for a snapshot under the same hydrologic conditions. This was also the first time that all samples were measured by the same laboratory under the same conditions. As a result, we have developed an excellent baseline for acidity under spring conditions. The survey will be repeated at least twice more, in summer and fall of 2003.

The second project will begin a sampling regime on the Union River tributaries originally included in the EPA INSTUD project of the mid 1980's and to continue the sampling on the Narraguagus tributaries and main stem that started in 2000. We proposed a two-year project period, which will yield three years of data on the Narraguagus due to the ongoing sampling. Episodic sampling will be handled by ISCO automated samplers, already installed, and base flow samples

will be collected bi-weekly by hand. Sampling should continue for at least two years to minimize the effects of anomalous precipitation and weather patterns. Samples will be analyzed for base cations (Ca, Mg, Na, K), anions ( $\text{NO}_3$ ,  $\text{SO}_4$ , Cl), ANC, air-equilibrated pH, closed-cell pH, DOC, conductance, total Al, exchangeable Al, and organic Al for the Union and Narraguagus River tributaries samples. Some samples may be analyzed for the major acidity-related variables to reduce costs: pH, ANC, conductance, and color. The data will be compared among watersheds to determine landscape characteristics that may influence water chemistry. These data will also be compared to data from 1985-87 to determine long-term patterns in water chemistry.

The funding from the USGS grant has allowed us to pre-purchase equipment (ISCO) to initiate sample collection while other funding agencies acquired funding for the projects, allowing us to begin sampling at the beginning of the all important spring melt instead of the beginning of the fiscal year. This funding has partially supported three researchers, allowing them to work with NOAA Fisheries and the Atlantic Salmon Commission to develop not only the two projects above, but to gain the opportunity to submit a proposal for a large-scale acid related chemistry study in Downeast Maine.